PUBLIC SQUARES IN EUROPEAN CITY CENTRES

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ABSTRACT

During the latter part of the 20th century, while a small number of exemplar city centre squares continued to be attractive places, the vast majority acquired either an image of empty spaces or an unattractive picture as traffic islands. This was emphasised by the decline of traditional community activities and the perception of comfort generated by internalising external space; coupled with a commodifying of cities in which they were merely viewed as commercial and retail opportunities. Communities need public spaces as places for assembly. They are the physical manifestation that each community is coherent and vibrant. Increasingly it is being recognised that identity and place have enormous roles in reinforcing society. The re-introduction of public squares is part of reversing the erosion of the public sector and the public realm, and reclaiming city centres from private interests for the benefit of communities. Criteria for comfortable external spaces have been researched, and these recognise the differences between northern and southern Europe. The most recent advances are in the simulation of city centre design; which includes geometry, uses, pedestrian movement and environmental conditions. There is confidence to be gained from visualisation of how squares will look, feel and be used; and will make a real contribution to sustainable urban design.

KEYWORDS

squares, city centres, pedestrians, public realm, communities

INTRODUCTION

The aim of this paper is to address three major issues:

- Why there has been a decline in public squares
- Why it is important to re-introduce public squares
- How to re-introduce public squares

A framework for geometric criteria from a previous study (Giddings, 1996) is tested with new data from five exemplar squares in northern European cities (Charlton, 2010). However, much of the research for this paper is in manipulating software that can simulate solar access and thermal comfort, wind flow, noise mapping and pedestrian movement (Charlton et al, 2008) ie, what is the effect of changing the geometry on these qualities? Chamberlain Square in Birmingham is selected from the exemplar squares, to highlight the positive aspects of public squares; and is tested and simulated in terms of microclimate and pedestrian movement. This is a demonstration of how new public squares can be designed by simulating all the various aspects. Finally a vision is presented of how public squares could be designed in future – using virtual city models.

THE DECLINE IN PUBLIC SQUARES

Urban space has always been the place for the community rather than the individual and therefore public rather than private in nature. Historically, activities that occurred in urban spaces have been representative of that settlement. They were places where the framework of society was formulated, and where economic activity thrived. A common theme among urban pioneers is that the popularity of particular cities is derived, at least in part, from space that is defined by buildings rather than the commercial 20th Century model in which buildings are seen as artefacts dropped into space (Alexander, 1987). Squares are special urban spaces, provided for the benefit of the public. Initially, this facilitated ready defence against external aggression but the developing courtyard form offered more symbolic value. Of all types of urban space, squares are the most representative of the values of the societies that created them – the agora, forum, cloister, mosque courtyard are examples. Traditional functions included:

Trade: buying and selling, depository and manufacture
Information: dissemination of news – place of social activity
Recreation: games, teaching, lunch and conversation
Protection: militia, training and drill, gathering in times of danger
Piety: holy inspiration and prayer, open space before a church for worship
(French, 1983)

However, Krier (1979) articulates a general feeling that towards the end of the 20th Century, these functions had either become outdated or changed location and the public square had become synonymous with an empty space. The loss of symbolism in particular, was greatly lamented by Giedion (1962). The empty spaces were often filled with vehicles and many squares presented an unattractive picture as traffic islands. Gehl and Gemzoe (2001) observed that the private car was invading public space. The loss of the city squares as places for citizens, seemed to hasten the commodifying of cities in which they were viewed merely as commercial and retail opportunities; and the downgrading of the public realm by privatisation. Modern landmarks started to reflect the values of commercialism, where offices and retail units replaced buildings that were more representative of society. City streets and squares were covered-in by malls. These have the illusion of being public, especially as they occupy public space, but are operated by the private sector (Giddings *et al,* 2005). There also grew a perception, mainly emanating from the United States that public spaces were dangerous places. Fear of crime began to deter people from using them (Woolley *et al,* 2004). Much of this negative perception was aimed at young people, and notions such as urban youth culture, clientele of the young with large disposable income (Worpole and Knox 2007), and youthful playscapes (Chatterton and Hollands, 2002) dominating city centres, encouraged increasing privatisation. Often the process happened through public-led urban regeneration initiatives, with resulting developments being owned and managed by private landlords who have the power to restrict access and control activities (Minton, 2006). It also enabled the private sector to operate a form of social control through segregation; and the attendant growth in private security enabled a reduction in police costs. Private developments on public space provided a further income for the city authorities through the tax base, as well as offering profitable ventures for private enterprises. What was left of public space was often rented-out by local governments for commercial purposes; and what has been termed cafe-creep (Kohn, 2004), spread commercial interests even deeper into the public realm.

THE IMPORTANCE OF PUBLIC SQUARES

There is a growing body of evidence that public space is able to deliver a range of benefits across economic, social and environmental spheres. A high quality public environment can have a significant impact on the economic life of urban centres. The presence of squares and other public spaces become vital business and marketing tools: companies are attracted by public places and these in turn attract customers, employees and services. Public spaces are open to all, and as such represent a democratic forum for citizens and society. They can bring communities together, provide meeting places and foster social ties of a kind that have been disappearing in many urban areas. These spaces shape the cultural identity of an area, are part of its unique character, and provide a sense of place for local communities. One of the benefits of high quality public space is its potential as a venue for social events. Well managed festivals and other events can have a very positive effect on the urban environment, drawing the community together and bringing economic, social and environmental benefits (Pugalis, 2009). Squares, in particular, can reintroduce the kind of civil society that has been lost in too many cities (Woolley *et al,* 2004). According to Mattson (1999) citizens have made it clear that they need spaces where they can interact with fellow citizens and try to persuade others of their viewpoints. Lack of public space is an insidious expression of a lack of democracy. In the past, public squares were invested with symbolic power that could evoke pride and public interaction. A crucial role of architecture and urban design in a democracy is the creation of public spaces that encourage civic interaction and discourse.

Much of the negativity about city centre squares is derived from zoning policies, in which centres are viewed as the sole province of retail and commercial activity. In many popular European cities, squares are part of mixed use areas that include residences above ground floor level; so that 24 hour occupation of buildings is maintained and natural surveillance provides for defensible space, re-assuring those using city spaces at any time – in a similar way to Newman's (1973) proposals. Public squares have important social and cultural roles, providing people with places to meet, rest or stop and talk. These activities evidently take place where outdoor areas are of suitable quality. They also provide important focal points, which demonstrate that visitors have reached the heart of the city. Historic or otherwise significant buildings need a context, and squares can be an expression of civic pride, historic power and importance (Chesterton, 1997). The significance of a renaissance of buildings and activities that define society cannot be over-stated; and the importance of bringing symbolic buildings back to prominent positions in city centres; and locating them in proper settings is at its core. This leads to the concept of a square for every symbolic building. Increasingly it is being recognised that identity and place have enormous roles in reinforcing society.

In recent years, there have been numerous city centre pedestrianisation schemes throughout Europe, aimed primarily at rescuing pedestrians from the domination of motor vehicles. For example in 1981, there were approximately 1450 pedestrianised precincts in UK towns and cities (Roberts, 1981). By 1995, approximately 37% of principal city streets in the UK were pedestrianised compared with less than 5% in 1971 (Colliers Erdman Lewis, 1994). While in Copenhagen, there was 20,500 m^2 of pedestrianised space in 1968, 50,000 m^2 in 1986 and 71,000 m^2 in 1995 (Gehl, 2006). Pedestrianising city spaces is literally a step forward as it shows the public demand for them; but it has its limitations. First, large areas freed from vehicles can reduce options for drivers, and generate choking routes at the periphery. Secondly, streets designed for vehicles may not feel particularly comfortable for pedestrians. Thirdly, surrogate squares are often generated at road junctions, without the possibility to introduce spaces that really act as squares. The dimensions may not be appropriate, gaps between enclosing buildings too large, and so on. City design requires networks of properly conceived streets and squares – introducing pedestrians to symbolic buildings, culture, entertainment as well as commercial activity. The re-introduction of public squares needs to be viewed as part of reversing the erosion of the public sector and the public realm, and reclaiming city centres from private interests for the benefit of communities. The central idea is that people need spaces in which they can conceive of themselves as citizens committed to political debate and persuasion; and as neighbours with common educational and cultural needs. Without these spaces, citizenship wanes (Mattson, 1999).

HOW TO RE-INTRODUCE PUBLIC SQUARES

Often local authorities own city space, or least have major influence on how it is developed. Design is more than just providing any space between commercial and retail buildings. Planning gain can be derived from these private sector developments as a means of creating new squares. They also need to be comfortable places. As Chesterton (1997) points out, a space needs to offer shelter, particularly from the wind. Even relatively unattractive places have been successful where they offer sheltered open spaces in the city centre. Criteria for comfortable city centre squares have been researched, and these recognise the differences between northern and southern Europe.

A Framework for the Design of Squares

A study undertaken to establish a frame of reference for a city structure approach to urban design (Giddings, 1996) included criteria for the three dimensional geometry of squares. The study was based on academic literature from Sitte (1889) to Tibbalds (1990), as well as investigating popular northern European cities and selecting two comparable districts in Stuttgart and Amsterdam for detailed measurement and analysis. A particular influence was Lynch (1960) with his well-known analysis of city centres through elements termed paths, edges, districts, nodes and landmarks. More recently, this kind of analytical approach has been developed into a multiple centrality assessment by Porta, Crucitti and Latora (2008). Their assessment examines the relationship between nodes and generates optimum locations within the spatial system. In the context of this paper, nodes are city centre squares. Another study (Charlton, 2010) selected five exemplar squares from different countries in northern Europe to further test the framework. It is shown in Table 1 that the criteria remain appropriate.

The restriction until recently, has been that although it was possible to analyse existing popular squares and produce a frame of reference; the notion that a square designed to those criteria would be successful, had to be taken on trust. There was no guarantee that the microclimatic conditions would be favourable, that people would be comfortable interacting with it; and indeed even the visualisation of the proposal relied on traditional architectural communication techniques. It has been discovered that even a concept as unsustainable as recent masterplanning has benefitted from pictorial three-dimensional visions; demonstrating how more sophisticated images can assist with decision-making and fund raising (Giddings and Hopwood, 2006).

cities	**dimensions small: 30x12 avge: 70x50 90x35 max: 100x70 120x50**	**length to width 1.1 to 3.0:1**	**length to height 1.4 to 8.0:1**	**width to height 0.8 to 3.0:1**	**perimeter 75-335**	**number of openings 2-5**	**%tage of perimeter 8%-28%**
Giddings (1996) all dimensions in metres							
Birmingham	70 x 60	1.2:1	3.5:1	2.0:1	254	5	23
Bruges	70 x 45	1.5:1	5.2:1	2.3:1	230	3	9
Hague	70 x 30-40	2.0:1	6.0:1	2.7:1	207	4	12
Bonn	70 x 25-50	1.9:1	3.5:1	1.1:1	220	3	14
Paris	100 x 45	2.2:1	3.2:1	2.2:1	286	4	18
Charlton (2010) all dimensions in metres							

Table 1 Geometric Criteria and Results from Five Exemplar Squares Northern European Cities

There is confidence to be gained from visualisation of how squares will look, feel and be used; and this will make a real contribution to the longevity of sustainable urban design. With the current research, in addition to geometry - measures of temperature, wind and noise are also taken; to assess them against the following microclimatic criteria, and to validate the software modelling intended for incorporation in the design of future squares:

Microclimate		
Temperature ^{0}C	Wind in miles per hour (mph)	Noise db(A)
13 - 24 Gehl (2006) Pushkarev and Zupan (1975)	<4 - no noticeable pedestrian discomfort 4-8 - wind is felt on the face Cooper Marcus and Francis (1997)	40 – private discussion 50 – ambient background noise level light traffic 30m away 60 – conversation at 1m singing birds 65 – maximum at night to avoid sleep disturbance 70 – maximum during day to maintain acceptable internal noise levels Sharland (1972) Sacre (1993)

Table 2 Microclimatic Criteria for Squares in Northern Europe

The primary differences between northern and southern Europe is that in the north, it is not usual for the climate to produce temperatures of over 24^{0}C; whereas uncomfortable winds speeds of over 8mph are commonplace. Thus the objective in northern Europe is to design squares that provide temperatures of more than 13^{0}C, on as many occasions as possible, while minimising the number of days that the wind exceeds 8mph. Wind speeds of less than 4mph are generally the most comfortable, and ideally would only increase to 8mph, as the temperature approaches the preferred maximum of 24^{0}C. In southern Europe, the squares tend to be smaller and more enclosed, to maximise shading. There are more hours of sunlight, the temperatures are higher and the wind often less. Thus, the objectives in southern Europe are to lower temperatures and increase air movement.

The other major part of the current research is modelling pedestrian movement. In order to avoid the claims that squares will remain empty spaces, simulated pedestrian activity related to the dimensions of a proposed square, the size, number and nature of openings, its detailed design; and the uses of its enclosing buildings need to be demonstrated.

Software Modelling

A comparative analysis of microclimatic and pedestrian movement software was undertaken (Charlton et al, 2008) and the following were selected as the most accurate and compatible for the analysis and holistic design of public squares. A fundamental criterion was the need for three dimensional simulation. There are a number of well established simulation software systems that can only operate in two dimensions. Thus the following software was selected:

Microclimate	
solar access and thermal comfort	TownScope
wind analysis	Star – CCM+
noise mapping	Cadna A

Pedestrian Movement	Legion Studio with Legion 3D

Table 3 Microclimate, Pedestrian movement and selected software

Microclimate

solar access and thermal comfort

A selection process based on available software revealed that a Belgium product, TownScope is the most appropriate choice for simulating these aspects. It can import both 3Ds and DXF file formats, add meteorological parameters (humidity, clouding, etc.) and vegetation masks specified as monthly data, create terrain from 3D points, and can render opacity and daylight shadings. To define the surrounding materials, TownScope offers a database of the most common materials found in the urban realm. It has a relatively sophisticated capability to assess direct, diffused and reflected energy; total sunlight time and total shade time. It can also estimate the variation in temperature from the city meteorological data at any time. Currently this takes a considerable amount of computer power. Software development is therefore needed to produce a package that can be run on standard design office computers (http://www.townscope.com/).

wind analysis

Wind flow has already been identified as having a substantial effect on the comfort of pedestrians. The factors that can modify natural wind speed include the size and shape of the space, openings and the nature of the enclosing buildings. Permeable features such as trees, hedges, fences, etc., can also reduce wind speeds. Of the available software, a computer fluid dynamics tool devised for the engineering industry was selected. It is termed STAR-CCM+, and has a long established reputation of providing solutions to complex problems in fluid mechanics, as well as being the most versatile platform for industrial computer fluid dynamics simulation. Developed by CD-adapco in the USA, the latest version offers CAD importation and preparation, meshing, model set-up and iterative design studies - enabling the user to achieve more accurate results in a shorter time period (http://www.cd-adapco.com/products/STAR-CCM_plus/index.html).

noise mapping

Noise is part of the daily assault on the senses and a major source of urban pollution. Solid walls are the most effective sound barriers. However, to be effective they must be sufficiently long and high, and close to the source of the noise or to the people to be protected. Thus, the arrangement of the enclosing buildings and the detailed design of the space, is the most visually appropriate means of controlling sound. The software, CadnaA (computer aided noise abatement) was selected for this research, as it appeared to have features absent in other noise mapping software that would assist in generating, adapting and editing models. Developed by DataKustik in Germany, the software has powerful calculation algorithms, extensive tools for object handling, the ability to import and export information from Google earth, outstanding 3D visualization and a user-friendly interface. It is also able to communicate with other applications, such as CAD software and GIS-databases. Originally devised for noise pollution from industrial sites, road and rail – since it has been used in this research, the company has added entire towns and urbanized areas to its portfolio (http://www.datakustik.com/en/products/cadnaa/).

Pedestrian Movement

This is the essential ingredient of public squares. Without people, squares have no justification and there would be a return to the image of empty spaces. Pedestrian software can either be a 2D or 3D application used to model the movement and flow of pedestrians within a given space and environment. The methodology identified and filtered the software applications capable of pedestrian movement, and selected the software application Legion Studio with Legion 3D as being considered appropriate for the research, in order to achieve a three dimensional application, realistically-rendered pedestrians and other animations. Legion was designed to simulate pedestrian movement at transport interchanges and sports stadia. This research has extended its application to city squares. More information on this product can be found at (http://www.legion.com/).

EXAMPLE – CHAMBERLAIN SQUARE

This is the exemplar square from Birmingham in the UK (see Table 1), and will be used to demonstrate activities, microclimate and pedestrian movement. Any of the other squares – Burg in Bruges, Grote Markt in The Hague, In der surst in Bonn or Burg in Paris, could have been chosen as they all meet the criteria. However, as Corbett (2004) points out Birmingham's City Centre Design Strategy is focused on the delivery of new and improved city squares. As shown on Figure 1, the square is bounded by the Public Library and Municipal Offices to the north, the Council House, Museum and Art Gallery to the east, the Town Hall to the south and Paradise Forum cafes and shopping to the west. The openings are a relatively high percentage of the perimeter (see Table 1), suggesting quite high pedestrian numbers. Public art includes statues of Thomas Attwood (Figure 3), Priestley, Watt, and Dawson. In urban design terms, the square is a fitting, high quality setting for the historic buildings as well as an attractive and distinctive space in its own right. With the existing and developing public facilities around it; including the School of Music, the square is increasingly being viewed as a cultural hub. It is also an important component of the east-west pedestrian spine, which is an attractive route of squares and promenades. Chamberlain's memorial and central fountain form the focus of a distinctive amphitheatre, where people sit out in fine weather. It also acts as a stage for a variety of public events and as a speakers' corner (Sparks 1993). The amphitheatre design exploits the 6m change in level, and enhances the setting for these activities.

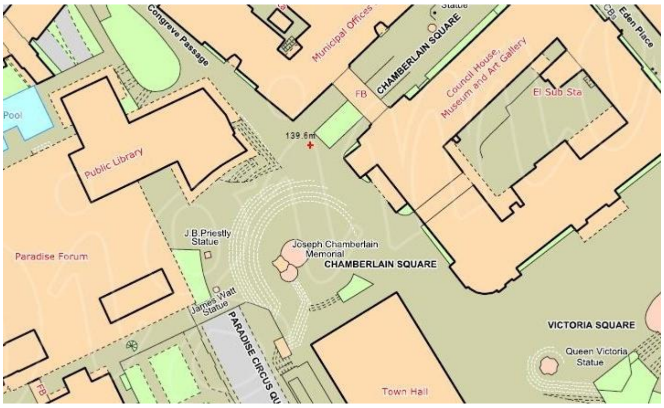


Figure 1 Plan of Chamberlain Square, Birmingham, UK

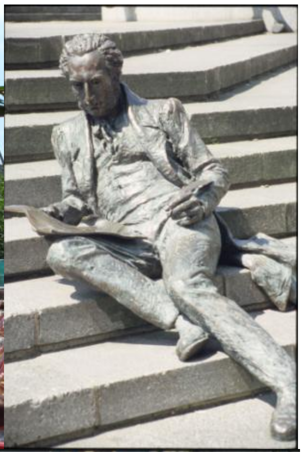




Figure 2 (top left) Birmingham Beach June 2009 Chamberlain Square
Figure 3 (top right) Statue of Thomas Attwood (political reformer) on the steps of the amphitheatre
Figure 4 (bottom) Pedestrian Movement between Chamberlain Square and Victoria Square

For simplicity, the measurement of temperature, wind and noise; and their simulation with the software outlined above, was undertaken on a single day – 26 May 2009.

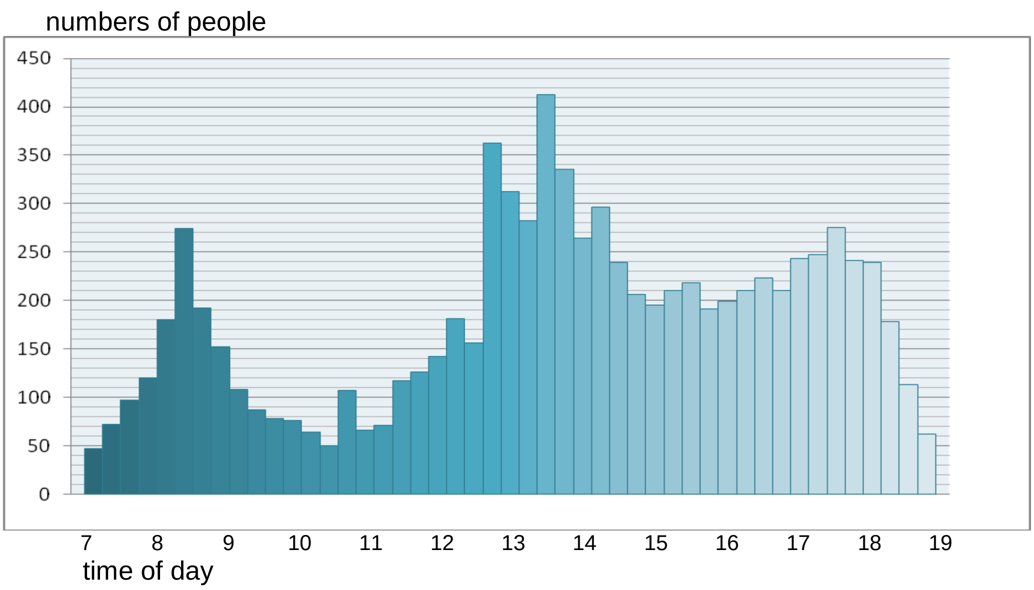
Microclimate – sample 26 May 2009			
measure	average climate in Birmingham (1)	average microclimate in square (2)	simulated with software
temperature	13^{0}C	18^{0}C	18^{0}C (3)
wind	15mph	6mph	6mph
noise	not applicable	60dbA	60.5dbA

Notes:
1. average climate in Birmingham on 26 May 2009 (http://www.meteoarchive.com)
2. average figures from 7 locations in the square, measured morning, mid-day and evening
3. data from the simulation includes a solar access pattern throughout the day

Table 4 Measures of Climate, Microclimate and Simulation for Chamberlain Square

The results show that on a sample day, Chamberlain Square enjoys a more comfortable microclimate than the natural climate in Birmingham. The temperature in the square was raised by 5^{0}C and the wind reduced by 9mph. The simulated figures appear very similar to those measured. Thus, there is confidence that the simulated figures which will be produced for future designs of public squares, will be realised in practice.

Figure 5 shows the number of people moving every 15 minutes in a westerly direction ie from Victoria Square towards Paradise Forum during a sample day of Monday 30 June 2003. These are the most recent comprehensive data collected by Birmingham City Council. The survey showed similar numbers for the easterly movement. The total number of people who moved in one direction during the day was 8545.



(Birmingham City Council 2003)

Figure 5 Pedestrian Movement Figures for Chamberlain Square

This is an extraordinarily high figure for just one of Birmingham's squares, and clearly demonstrates the attraction to pedestrians. Of the total number, only 85 were aged between 11 and 17 years old – dispelling the perception that city centre spaces are dominated by an urban youth culture.

Simulation of Pedestrian Movement

The software can predict pedestrian movement within external spaces. Measures of pedestrian numbers from city data, together with building uses, and entry/exit points are entered; and scenarios for pedestrian movement can be simulated. Figure 6 shows a still frame from a time-related moving sequence. In this case it has been applied to Chamberlain Square but could equally well be applied to the design of a new square.

Figure 6 Simulation of Pedestrian Movement in Chamberlain Square

THE VISION

This research has proved that software can be used to predict solar access and thermal comfort, wind speed and movement, noise, and pedestrian movement for proposed public squares at design stage. However, the study revealed that none of the software is well developed and the simulation takes considerable computer power. Thus, significant programming work is required before a design tool could be available. An alternative could be to utilise the virtual city models that are becoming common-place in British and other European cities (for example see Figure 7). Currently, these are based on virtual reality, but layers of building information modelling could be added to produce a database of climatic information and existing pedestrian movement in three-dimensional form. The intention is that designers will be able to log onto the appropriate city model, and insert their designs. The building information modelling database will then be able to predict the microclimatic conditions and pedestrian movement. In this way, different locations and geometric configurations can be tested until the optimum solution is achieved. The detailed design of subspaces, landscaping, seating, public art, lighting, canopies and umbrellas can be added to the model and their effects on microclimate and pedestrian activity observed. High levels of pedestrian activity are usually desirable, provided there is not overcrowding; so that there are still places to rest and linger, and there are no pressure points at entrances and exits to the squares.

Figure 7 Birmingham Virtual City Model with Chamberlain Square at the centre

CONCLUSION

This paper has outlined the reasons for the decline of public squares in European city centres, analysed why they are important and why they should be re-introduced. Previous studies were summarised and it was shown that the framework developed for the design of new squares is still valid. However, there was inactivity in progressing the criteria beyond geometric parameters due to the lack of tools. Software is now becoming available that can simulate microclimatic conditions and pedestrian movement. An existing exemplar square in the UK was selected to demonstrate these tools, which are on the point of being ready for use in the design of new squares. Innovative visualisation techniques are already being adopted by developers, and these can also be used in the promotion on new squares. Future studies were identified and these include The Vision, in which virtual city models will not only be able to show the proposed design of these squares but also provide simulated data on the microclimate and pedestrian movement that will result from them.

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